CLAIMS

What is claimed is:

1. An electroionic apparatus for disinfection and oxidation of aqueous solutions comprising:

an AC power source coupled to a flow cell;

said AC power source operable to create an electromagnetic field around said flow cell; and

wherein said aqueous solutions pass through said flow cell.

2. The electroionic apparatus of claim 1 wherein said flow cell is inductively-coupled.

3. The electroionic apparatus of claim 1 wherein said flow cell is capacitively-coupled.

4. The electroionic apparatus of claim 1 wherein said flow cell is directly coupled.

5. The electroionic apparatus of claim 1 wherein said aqueous solution contains water and oxygen and said ionic current flow generates hydrogen peroxide in said aqueous solution.

6. The electroionic apparatus of claim 1 wherein said aqueous solution contains iron and said ionic current flow generates hydroxyl radicals.

7. The electroionic apparatus of claim 1 further comprising a pair of opposed extended electrodes mounted in aligned spaced relation to define spaced walls of a pipe or open channel section with said aqueous solution flowing between said electrodes.

8. The electroionic apparatus of claim 1 further comprising monitoring means.

9. The electroionic apparatus of claim 8 wherein the monitoring means includes monitoring of hydrogen peroxide with an on-line ultraviolet (UV) spectrometer.

10. The electroionic apparatus of claim 8 wherein the monitoring means includes monitoring dissolved oxygen in the water.

11. The electroionic apparatus of claim 8 wherein the monitoring means includes a fluorometric monitor to detect and quantify the total microbial population density of said water.

12. The electroionic apparatus of claim 11 wherein said power supply has an input control to adjust the power output level and where said fluorometric monitor is connected to said input control of the power supply controller to adjust and minimize electric power consumption.

13. A method for electroionically processing aqueous solutions, the methods comprising the steps of:

passing said aqueous solutions through a passageway having opposed electrodes;

supplying an AC voltage across said electrodes and establishing current flow between the electrodes; and

creating ions of the material of said electrodes and operable for removal of contaminants from said aqueous solutions.

14. An electroionic apparatus for disinfection and/or oxidation of aqueous solution comprising:

a flow cell through which said aqueous solution flows;

an AC power source coupled to said flow cell;

wherein said AC power source is operable to create an electromagnetic field around said flow cell; and

wherein said aqueous solution flows through said flow cell for disinfecting and/or oxidizing said aqueous solution.

15. The electroionic apparatus of claim 14 further comprising a resonant inductive capacitive and resistive (LCR) circuit coupled to said flow cell.

16. The electroionic apparatus of claim 15 wherein said LCR circuit includes inductive, capacitive and resistive elements.

17. The electroionic apparatus of claim 16 wherein said LCR circuit includes a transformer.

18. The electroionic apparatus of claim 17 wherein said flow cell includes a solenoid.

19. The electroionic apparatus of claim 18 wherein said LCR circuit includes a feedback loop to sense current and adjust inductance and maintain resonance of the resonant circuit.

20. The electroionic apparatus of claim 14 further comprising capacitive circuitry coupled to said flow cell.

21. The electroionic apparatus of claim 20 wherein said capacitive circuitry includes capacitive and resistive elements.

22. The electroionic apparatus of claim 21 wherein said capacitive elements are connected in series.

23. The electroionic apparatus of claim 14 wherein said flow cell includes at least two spaced-apart electrodes.

24. The electroionic apparatus of claim 23 wherein said spaced-apart electrodes are coated with Teflon®.

25. The electroionic apparatus of claim 23 wherein said spaced-apart electrodes include a dielectric material coating at least one side of the electrodes to provide capacitive coupling.

26. The electroionic apparatus of claim 14 wherein hydrogen peroxide is produced in said aqueous solution.

27. The electroionic apparatus of claim 14 wherein hydroxyl radicals are produced in said aqueous solution.

28. The electroionic apparatus of claim 14 further comprising monitoring means.

29. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring oxygen.

30. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring hydrogen peroxide.

31. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring microbial populations.

32. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring biological oxygen demand (BOD) off-line.

33. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring chemical oxygen demand (COD).

34. The electroionic apparatus of claim 28 wherein the monitoring means is used for measuring total organic carbon (TOC).

35. The electroionic apparatus of claim 14 wherein said power supply includes an input control to adjust the power output level and minimize power consumption.

36. The electroionic apparatus of claim 14 wherein said electromagnetic field reduces microbial populations in said aqueous solution indirectly by producing hydrogen peroxide and hydroxyl radicals.

37. The electroionic apparatus of claim 14 wherein said electromagnetic field reduces organic compound concentrations in said aqueous solution.

38. The electroionic apparatus of claim 14 wherein said electromagnetic field reduces BOD, COD and TOC levels in said aqueous solution.

39. The electroionic apparatus of claim 14 wherein said aqueous solution is potable water.

40. The electroionic apparatus of claim 14 wherein said aqueous solution is wastewater.

41. The electroionic apparatus of claim 14 wherein said aqueous solution is process water.

42. The electroionic apparatus of claim 14 wherein said aqueous solution is primary effluent.

43. The electroionic apparatus of claim 14 wherein said aqueous solution is secondary effluent.

44. The electroionic apparatus of claim 14 wherein said aqueous solution is biosolids.

45. The electroionic apparatus of claim 14 wherein the aqueous solution is sludge.

46. An electroionic apparatus for lowering organic compound concentrations in an aqueous solution comprising:

an AC power source coupled to a resonant inductive capacitive and resistive (LCR) circuit;

a flow cell coupled to said AC power supply and said LCR circuit;

said AC power source and LCR circuit operable to inductively create an electromagnetic field around said flow cell; and

wherein said aqueous solution flows through said flow cell to lower organics in said aqueous solution.

47. An electroionic apparatus for lowering organics in a aqueous solution comprising:

an AC power source coupled to an capacitive circuit;

a flow cell coupled to said AC power supply and said capacitive circuit;

said AC power source and capacitive circuit operable to create an electromagnetic field around said flow cell; and

wherein said aqueous solution flows through said flow cell to lower organics in said aqueous solution.

48. An electroionic apparatus for lowering organics in a aqueous solution comprising:

an AC power source coupled to a resistive circuit;

a flow cell coupled to said AC power supply and said resistive circuit;

said AC power source and resistive circuit operable to create an electromagnetic field around said flow cell; and

wherein said aqueous solution flows through said flow cell to lower organics in said aqueous solution.

49. An electroionic apparatus for treating wastewater and/or potable water comprising:

a flow cell;

an AC power source coupled to said flow cell;

said AC power source operable to create an electromagnetic field around said flow cell; and

wherein said wastewater and/or potable water flows through said flow cell for disinfecting and oxidizing said water.

50. A flow cell assembly for disinfection of water including wastewater and/or potable water wherein said water flows through said flow cell, said flow cell assembly comprising:

an AC power supply coupled to an electronic circuit which is coupled to said flow cell assembly and operable to create an electromagnetic field in said flow cell assembly.

51. A method for electroionically processing aqueous solutions, said method comprising the steps of:

passing said aqueous solutions through a flow cell;

applying an AC power source to said flow cell; and

establishing an electromagnetic field around said flow cell for removing contaminants from said aqueous solutions.

52. A method for disinfecting and/or oxidizing aqueous solutions, the method comprising the steps of:

providing a flow cell for aqueous solutions to flow through said flow cell;

applying an AC power source to said flow cell;

creating an electromagnetic field around said flow cell; and

wherein said aqueous solution flows through said flow cell for disinfecting and/or oxidizing said aqueous solutions.

53. A method of generating hydrogen peroxide, said method comprising the steps of:

applying an AC power source to a supply of water containing oxygen; and

creating an electromagnetic field around said tank for generating hydrogen peroxide.